MALIGNANT DISEASES OF THE STOMACH AND PYLORUS.[1]

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CARCINOMA of the stomach causes about 1 per cent. of the total death-rate (Van Valzah) and is the most common form of malignant disease. Welch, in an analysis of 30,000 cases of malignant neoplasms, gives the percentage as 21.4, the statistics of Virchow at 35 per cent., and Haberlin 41.5.

Age has a more important bearing on carcinoma of the stomach than on the same disease in the lower portion of the gastro-intestinal tract. In the former locality it is peculiarly a disease of middle and later life; under thirty it is most rare, although Moore reports a case at the age of thirteen. It is slightly more frequent in males than in females (five to four, Welch), the disproportion, however, is not so great as the older authorities were inclined to believe.

The progress of the disease varies greatly, and is materially affected by the age of the patient, the situation of the growth, and its histological structure. Death may follow in three months from the first symptoms, or it may be delayed to two and one-half years,—the majority die within the year. Park is of the opinion that all forms of malignant tumors are on the increase; how much of this increase is apparent rather than real, and due to better methods of diagnosis, is open to discussion.

Surgery offers the only hope of cure; it is important that carcinoma of the stomach be considered a surgical disease, and a suspicion of gastric cancer should cause the physician to send the patient to the surgeon for exploratory incision to complete the examination. The same principles should govern here as in probable malignant disease of the breast or uterus. The great difficulty which arises in carrying this proposition into effect is the question of early diagnosis. In a general way it can be said that the early medical diagnosis of cancer of the stomach does not depend on any one specific sign or symptom, but rather on a collection of facts, each one of which, if taken alone, would have but little value; and, again, most of these symptoms are not developed to a characteristic extent until late. Osler relates a number of cases of latent cancer of the stomach in which there were no symptoms during life to lead to suspicion of malignant disease, the true condition being found at post-mortem.

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A person of middle or advanced life of previous good digestive power begins to complain of pain in the region of the stomach, difficult digestion, and loss of appetite. There is a continuous loss of flesh, especially the muscles; a progressive waste of the albuminous tissues; later, there is more or less vomiting depending on the situation of the growth, perhaps of blood partially digested and likened to coffee-grounds. A tumor may gradually become discernible (115 out of 150 cases, Osler). A dry cachexia develops, and transitory œdemas, most commonly affecting the lower limbs and due to a local phlebitis, may occur. This seems a clear clinical picture of malignant disease, but the fault is that, surgically speaking, the case has been hopeless after the first few weeks. Czerny, Kraske, and many other eminent surgical authoritites believe that radical operation is out of the question by the time a tumor can be felt.

Examination by means of stomach tests adds to our diagnostic resource. The absence of free hydrochloric acid is an indication of value, and occurs in 60 per cent. of all cases; but it is not always well marked early, and in the forms of malignant disease developing upon ulcer, of which a number has been collected and described by Hemmeter, the free hydrochloric acid may even be increased. Another valuable indication is the presence of lactic acid accompanied by the Oppler-

Boas bacillus. Reduced motor power of the stomach independent of obstruction is a constant symptom, but is also common to non-malignant disease, such as gastric myasthenia. Terrier in his recent work on surgery of the stomach says that "the examination of a fasting stomach gives the largest amount of information." The only positive diagnostic indication is the finding of cancer elements in the fragments washed out of the stomach; here again, unfortunately, the spontaneous detachment of such specimens in an early stage of the disease must necessarily be a very rare occurrence. The value, however, is absolute, and efforts in this direction are increasing. In the laboratory of Boas, the first systematic efforts to detach pieces of the growth for this purpose were made.

To also locate the point from which the pieces are detached, Kuhn invented a spiral sound which could be watched with the X-ray. Hemmeter has systematically developed this method of examination to a great extent both in the means of detaching the fragments and in the certainty as to the location of their origin, the examination being conducted after the manner of uterine scrapings. The latter authority calls especial attention to the diagnostic importance of atypical as well as pathological mytoses of the cells. One important point remains to be determined. Is there danger of increasing the spread of the disease by diagnostic curetting?

The removal of pieces of malignant growth for microscopical examination is a doubtful practice. Senn warns against the rough handling of a malignant tumor for the purpose of making a diagnosis, and says that such "diagnostic massage" may result in increased activity.

Halsted opposes the removal of portions of a malignant growth for diagnostic purposes on account of the danger of inoculation. Whether this objection would hold good in the necessary manipulations for the removal of fragments from a gastric cancer is worthy of consideration. Examination of the blood shows reduced specific gravity, diminished hæmoglobin, and number of the red corpuscles and reduction in their size; these changes are due to the anæmia, and have no special characteristic in malignant disease of the stomach. The white corpuscles are often increased by the accompanying inflammation and ulceration. The urinary changes are in no way peculiar to the cancerous process. The indican, so frequent an accompaniment, is the result of the retention, and the other changes to the albuminous waste and low state of the nutrition.

Van Valzah says that careful and repeated examination of a suspicious case of carcinoma of the stomach should develop a probable diagnosis in two or three weeks.

The scientific zeal with which the diagnosis is sought has in itself a distinct danger. The suspicious case is often kept under observation too long in the hope of making a positive diagnosis. The surgeon should not ask the physician for a diagnosis of gastric cancer; if we wait for that, we are pretty sure of being too late. It is the suspicious cases which should be explored, and it is the duty of the physician to urge this when in doubt.

A few indications with the history should suffice, and the matter laid before the patient to decide as to an exploration. There is no reason why the radical cure of cancer of the stomach should not approach that of the uterus or breast. It is true the difficulties of diagnosis are increased, yet the early symptoms are as positive. The tumor in the breast at an early stage is unnoticed, or no attention paid to it, and the early history of cancer of the uterus is notoriously defective. The result is, that the number of cures in either breast or uterine cancers is not large. The majority have passed the curable stage before the diagnosis is made. This has been and will be true of the stomach, but the results should be much better than they are.

Section 2.—The curability of cancer of the stomach depends upon the (*a*) Histological structure of the neoplasm. (*b*) Its location. (*c*) Extension to neighboring structures. (*d*) Lymphatic infection. (*e*) The general condition of the patient. It is essential that the relative value of the manifestation of the malignant process be studied, for upon a correct appreciation of the conditions present depends the whole question of treatment.

(*a*) Every cancer is at one time a local process, and in that stage curable, but the duration of this stage is usually short. The rapidity of progress of carcinoma of the stomach is largely influenced by the relation of the cells to the stroma. If the cellular elements predominate the growth is soft and its extension rapid. If the stroma is in excess of the parenchyma, the tumor mass is harder and slower of growth. Hemmeter classifies the malignant epithelial tumors of the stomach into (1) Adenocarcinoma, (2) Cylindrical carcinoma, (3) Medullary carcinoma. The common degenerations being colloid and scirrhus. The colloid type is usually an unfavorable indication, and if it exists to any extent indicates a late stage of the disease beyond radical intervention. Secondary nodules, the result of a primary gastric cancer, are especially prone to this form of softening, and may obscure the original focus. In the metastatic deposits in the omentum, colloid degeneration may develop a tumor of very large size. Sutton describes one weighing ten pounds. Scirrhus refers to the relatively large proportion of connective tissue stroma which is undergoing more or less contraction, and indicates a slower process. This variety is the most common form of stomach carcinoma (72 per cent., Brinton).

Pyloric growths are usually scirrhus, and often follow the lines of the blood-vessels encircling the pyloric end of the stomach, producing an early obstruction and may cause death, while still an operable growth. In some cases the contraction may not take place, leaving the pylorus open and gaping. More rarely, diffuse infiltrating carcinoma of the whole stomach wall may exist either as a primary or secondary process. This disease is more common than cirrhosis of the stomach (Bristowe's water-bottle stomach) and often mistaken for it. Hektoen, in describing two cases of the primary form, calls attention to the necessity of careful search for the carcinoma cells to prevent misconception as to the nature of the disease.

The cylindrical cell carcinoma is the most favorable form of disease for extirpation. It is slower of growth, and does not develop adhesions to neighboring organs in the early stages.

(*b*) The location of the growth is important, an early diagnosis depending to some extent on the mechanical features present, and the accessibility to operative procedures is very largely determined by the situation. Approximately, 10 per cent. involve the cardiac area, 30 per cent. the body, and 60 per cent. the pyloric end of the stomach (Gussenbauer).

The cardiac orifice is seldom the primary seat of disease, but rather an extension upward from the fundus or downward from the œsophagus. The symptoms are painful deglutition, and later obstructive regurgitation. The clinical diagnosis is comparatively easy, but the situation renders radical operation exceedingly difficult and usually impossible. The progress of malignant disease of the cardia is rapid; it involves neighboring structures early, and death follows active symptoms within a few months. Carcinoma of the body is most difficult of early diagnosis, as a rule presenting few symptoms until it is well advanced, unless by extension it involves one of the orifices, and thereby introduces mechanical phenomena. Einhorn thinks the gastro-diaphranoscope is useful in outlining a tumor of the body. The X-ray has been used for the same purpose, the utility of either is doubtful. Kocher says that under deep anæsthesia a tumor can sometimes be mapped out early. It is fortunate that the pylorus is so often affected; the mechanical obstruction favors an early diagnosis, and, as shown by Winniwater more than twenty years ago, many cases die from starvation produced by a surgically curable growth. Israel states that the pylorus itself is not so often the primary seat of disease as has been thought; the infiltration from any place in the pyloric end of the stomach naturally extends in this direction and is arrested at that point.

In the earlier stages the process cuts off rather sharply at the duodenum. The situation is most favorable for extirpation. Obstruction with resulting dilatation of the stomach has usually been the most important factor in determining operation in the cases submitted to extirpation. Kocher states that, if food is regularly found in the stomach fourteen hours after taking, mechanical obstruction exists. Myasthenia with retention and hyperasthenic gastritis with retention give this symptom, and are not necessarily due to a mechanical obstruction, although valve formation often coexists. In these cases chronic dilatation is found, and often hyperchlorhydria or supersecretion. While the differential diagnosis is not difficult, surgery offers the best means of cure in all forms of chronic dilatation of the stomach. The finding of a dilated stomach brings the case within surgical limits, and if chronic retention exists, other things being equal, operative relief is indicated. The amount of dilatation due to pyloric cancer depends to some extent upon the situation of the pylorus; if held high by a short gastrohepatic omentum, the stomach is emptied by muscular contraction; in malignant disease compensatory hypertrophy is deficient, and dilatation comes on rapidly. If the pylorus lies low down, gravity aids the onward course of the ingesta, and a larger amount of obstruction is well borne.

(*c*) Direct extension to surrounding structures. Along the paths formed by adhesions the malignant infiltration takes place. In most instances this is a late phenomenon, and acts as a contraindication to operation, but not necessarily so if the case is otherwise favorable. The adhesions may be recent, and due to a septic process rather than the malignant disease. Advance adhesive inflammation takes place in the vicinity of ulceration, and, later, fistulæ may form between the stomach and duodenum or colon, or rarely with the abdominal coverings. Perforation occurs in about 6 per cent. of the cases, causing death at once if in the free peritoneal cavity, or subphrenic abscess if protective adhesions exist.

Indirect extension through the blood-vessels is, rarely, the cause of metastatic deposits. The arteries are very resistant, but the veins are more easily invaded, and from the infected thrombus emboli are carried to the liver, lungs, etc. Peritoneal inoculation is a rare sequela of cancer of the stomach. The most common method of advance is by extension to adjacent structures, and this is true of recurrences after extirpation, which are usually local.

From an operative stand-point adhesions are a serious complication, and, as they are usually infiltrated with carcinomatous cells, the extirpation under such circumstances will be unpromising. Haberkant's statistics of extirpation show that where adhesions were extensive 72 per cent. died. If no adhesions existed, only 27 per cent. died. Gussenbauer, in 542 cases of cancer of the pylorus, found that in 37 per cent. there were no adhesions, in 41 per cent. there was no metastasis to other organs.

(*d*) Lymphatic infection is a still more serious complication, because if palpable glandular malignancy can be established, it is altogether probable that the involvement has passed beyond reach. Enlargement of glands without microscopical proof cannot be considered necessarily malignant. In twenty-nine cases of non-malignant disease of the stomach which I have operated on for the relief of dilatation from benign causes, in more than half enlarged glands could be palpated.

Fenger, in his study of the effects of stone in the common duct of the liver, noted the fact that enlarged glands could sometimes be felt about the head of the pancreas, leading to the belief that malignant disease existed. Halsted found such non-malignant glandular enlargement occasionally in malignant disease of the breast. It has been frequently noted in the submaxillary glands during the course of lip carcinoma, and in malignant disease accompanied by inflammatory lesions it is to be expected. In due time these glands undoubtedly become malignant, just as inflammatory adhesions are later infiltrated. In my experience, the septic glands are smaller and softer than the carcinomatous. Mikulicz says the lymphatic glands tributary to the stomach lie in four groups:

First, along the lesser curvature and cardia; second, along the greater curvature; third, in the gastrocolic omentum; fourth, about the head of the pancreas. The modern operation for the removal of the glands with carcinoma of the breast suggests a similar glandular extirpation in radical operation on the stomach. Linder does not believe this feasible. In twenty-eight recurrences after extirpation fifteen were local, twelve distant, and only one involved the glands. Sutton says that glandular involvements are only found in about one-half of the cases dying with gastric cancer. It is probable that this is too low an estimate, and that at least 65 per cent. dying of cancer of the stomach have well marked glandular involvement. In the earlier stages, however, the percentage is smaller. The usual route of travel is to the deep glands, liver, etc.

Binnie, discussing carcinoma of the umbilicus secondary to cancer of the stomach, says that such unusual routes of travel are indications of inflammatory or mechanical impediments in the normal channels. He believes the infrequent recurrence in the glands after extirpation of stomach cancer is due to the destruction of the normal lymphatics at the time of operation.

Russell has recently pointed out that the cure of cancer of the uterus depended upon wider local extirpation rather than removal of the glands, and this statement is equally true of the stomach. An investigation leads to the belief that glandular infection in cancer of the stomach is not uniform, many cases die without such infection, and that a moderate enlargement may be septic. Should they become infected, their situation renders radical removal practically impossible.

(*c*) The condition of the patient is a factor of importance. Malignant disease of the stomach has a peculiar depressing effect. The nutrition is bad and the healing power is greatly impaired. Under equal conditions, a most formidable operation for malignant disease about the head or neck would be well borne. A degree of cachexia out of proportion to the demonstrable disease is of bad omen, unless the debility can be shown to be due to a mechanical condition, such as obstruction. Ascites even in a limited degree contraindicates a plastic operation, such as gastro-enterostomy, and renders any kind of an operative procedure hazardous, as firm adhesions do not take place.

Sarcoma of the stomach is a rare disease; in 1899, Van Valzah and Nesbit found forty-three cases recorded. It is more common in males and under thirty-five years of age. Finlayson recently reported a case in a child three years of age. The disease may present itself as a smooth, rounded tumor, and by its weight may cause considerable prolapse of the stomach. In some of the cases reported the tumor had a limited origin in the stomach wall and was easily extirpated. Rarely it occurs as a diffuse sarcomatous infiltration. Sarcoma seldom contracts, and involvement of the orifices does not produce the mechanical interference with the progress of the food so marked a symptom of scirrhus; incontinence is the rule. It is more often a secondary involvement of the stomach than carcinoma. The diagnosis in the cases operated upon has seldom been made, the operation being usually commenced under a misapprehension as to the nature of the growth. In the majority of instances there were no marked gastric symptoms to suggest that an abdominal tumor present had its origin in the stomach. In a few cases ulceration and hæmorrhage have been a late symptom. Baldy, in 1893, removed almost the whole of the stomach for sarcoma without success. A number of partial gastrectomies have been recorded with successful outcome. In several of the cases the tumors removed were of considerable size.

Section 3.—The exploratory incision for suspected cancer of the stomach, instead of being a last resource, should be one of the first, and promptly undertaken if the condition cannot be proved to be non-malignant. A median incision between the ensiform cartilage and the umbilicus is most useful for stomach exploration. A small opening readily exposes the pyloric portion, which is the most common seat of disease. The writer at times has experienced considerable difficulty, after opening the abdomen, in ascertaining the real condition. What are the local appearances which enable us by palpation and inspection to say that a certain thickening of the stomach wall is malignant? There are no definite signs which occur in all cases, and much depends upon the experience of the surgeon. It is hardly practicable to remove a portion of the growth and have a microscopical examination made before finishing the operation, nor is such practice devoid of danger of inoculation. In all of the cases I have explored the growth was hard and had an appearance of increased vascularity, and the general "feel" of the diseased part was distinctly malignant. At times, with the diseased part thoroughly explored and in some cases laid open by incision, it is impossible to state from macroscopical examination whether it is benign or malignant.

Czerny's experience is very interesting; four cases in which gastro-enterostomy was done for supposed malignancy lived so long as to preclude the possibility of cancerous disease.

Exploration of the neighborhood of the cardiac orifice is difficult and often unsatisfactory. A small opening may be made into the stomach cavity, and with a finger introduced through the incision the anterior wall can be invaginated to enable the exploring digit to search the opening into the œsophagus. Should the orifice be tightly closed, pressure for a little time may be necessary before a dimple can be felt at the normal opening (Abbe). For instrumental examination of the cardiac orifice, a small incision should be made in the anterior wall and the lesser curvature held taut, this forms a sulcus leading directly to the opening (Richardson).

The body of the stomach anteriorly can be readily examined, by traction a considerable portion can be drawn forth for inspection. By an incision through the gastrocolic omentum a portion of the posterior wall can be inspected. The pylorus is fortunately easily explored, and, unless adhesions have formed, it can be brought fully out of the abdominal cavity. If it is held within the cavity of the abdomen and under the liver, by a short gastrohepatic omentum this latter structure can be partly divided without injury to the nerve or blood supply, readily mobilizing the pylorus and upper portion of the duodenum. The author has in five instances been unable to make an exact diagnosis even after exploratory incision. In two, the pylorus was held high up and under the liver by adhesions, the symptoms being obstructive. If the disease was cancerous, the position and the extension to surrounding structures by adhesions would prevent radical operation. In each, a gastro-enterostomy was performed for relief of the mechanical condition present. In one, there could be felt a hard mass on the posterior wall, with signs of extensive inflammation in the lesser cavity of the peritoneum. There had evidently been a perforation; but, even with an incision in the anterior wall of the stomach, I was unable to tell whether it was malignant or not. Here, again, gastro-enterostomy was performed on the theory that if the perforation was due to simple ulcer, recovery would be hastened; and if carcinomatous, some relief would be experienced. In the fourth case a small stomach was found deep under the liver; with a finger inside the stomach cavity, I could not reach the cardiac orifice. The clinical evidence leads to the belief that the obstruction was malignant, and gastrostomy was decided upon without further attempt at diagnosis. In the fifth case the evidences of malignant obstruction at the cardiac opening were marked; the condition of the patient was such that gastrostomy was done as quickly as possible, without any attempt to freely explore as to the nature of the obstructive lesion. In twelve cases malignant disease was quickly shown too far advanced to extirpate, and, not presenting symptoms, such as obstruction, requiring palliation, nothing being left to do further than to rapidly close the abdominal incision. In one of my earlier explorations in which extensive malignant disease was found without symptoms requiring palliation, the incision was closed, and the patient put to bed to wait the usual length of time for healing to take place, the debility increased, and, while he lived several weeks, he was unable to return to his home before death.

Since that time I have closed the incision under such circumstances with permanent silver-wire sutures after the Halsted plan, and get them up on the third day, and let them leave the hospital in a week.

Silver wire buried in fixed aponeurotic structures, in my experience, does not give rise to the atrophy necrosis sometimes seen when placed in muscles. The hernia liability, in any event, is of no great consequence to the victim of an incurable malady. It may be justly said that exploration on cases of advanced malignant disease of this description is not good practice; yet there will always be a certain number of cases in which the diagnosis will be uncertain, although advanced disease exists. The extent to which the exploration will be carried will vary with different operators. Personally, I have not made undue effort to perfect the diagnosis if extirpation did not seem proper, and have been contented with giving such relief as the circumstances would permit.

Section 4.—Complete removal of the stomach has won a foothold, but to what extent the future only can determine. The more radical believe that even if the disease has affected only a limited and apparently excisable portion of the stomach, the whole organ should be removed, that pylorectomy and partial gastrectomy are not based on correct principles, and the large percentage of local recurrences after partial operations certainly give color to this view. Bernays calls attention to the improvement in the results of cancer of the uterus since complete hysterectomy has replaced amputation of the cervix, and believes that this will be true of the stomach. On the other hand, the number of successful complete gastrectomies are so few and of such short duration that the problem cannot be solved at this time. It is, however, altogether probable that complete gastrectomy is destined to become a most valuable operation. In cancer of the body nothing else in the way of radical operation offers a reasonable prospect of cure, and all the forms of pyloric cancer with a tendency to infiltrate the body of the stomach can be placed in the same category, reserving pylorectomy and partial gastrectomy for the not uncommon cases of ringlike infiltration. These later cases kill by obstruction, and there can be no more reason for a complete gastrectomy in such cases than in removal of the whole of the large bowel for a cancerous stricture of the colon. It is in these cases that the partial operation has achieved its triumph.

It is to the credit of American surgery that the first complete removal of the stomach was performed by Conners, an operation condemned at the time by reason of its unfortunate termination. It was Schlatter's success, not his originality, which called attention to the possibilities of gastrectomy, and the cases of Richardson, Brigham, McDonald, and others quickly gave it a standing, and more than fifteen operations have now been performed. The ease with which the duodenum has been approximated to the œsophagus in many of the reported cases is surprising; it certainly is an important factor in the result. The duodenum, on account of its diameter and function, certainly offers the best prospect of replacing the stomach, and it is yet to be determined whether an opening between the œsophagus and jejunum would serve equally as well. The case of Schlatter's was of this description, and the result was, functionally, as satisfactory as the œsophago-duodenostomy. In the determination of the advisability of gastrectomy, the ability to approximate the duodenum to the œsophagus is of importance. Richardson calls attention to the fact that a permanent duodenostomy might be made should it be impossible to make a competent anastomosis. A number of the deaths after partial as well as complete gastrectomy have been caused by including a portion of the mesocolon in the ligatures used to free the greater curvature of the stomach, with resulting gangrene of the transverse colon. If the gastrohepatic omentum is tied off first, the fingers can be slipped underneath the pylorus and act as a safe guide to the ligation and division of the gastrocolic omentum.

As to the form of union, the Murphy button and the simple suture plan have both been used. Opinion is divided as to which is of the greater merit. As elsewhere in the gastro-intestinal tract, the results seem to be about the same,—the one used depending more on the individual preference of the operator than any special indication. Mayo Robson, in the Hunterian Lectures for 1900, gives statistics showing a death-rate of 50 per cent.; the cases are yet too few from which to draw any accurate conclusions.

Pylorectomy and Partial Gastrectomy.—Operations limited to the pyloric end of the stomach and its immediate vicinity have been largely practised for malignant disease, and the results, taken as a whole, have not been satisfactory. A few cures have taken place in exceptionally favorable cases, mainly the malignant strictures, where the mechanical effects lead to an early diagnosis and operation. Limited extirpations to be successful must go wide of the disease on the stomach side, and the rule is return at an early date. This is particularly true if the infiltration extends laterally along the stomach wall, and less so if the line of invasion follows the blood-vessels in a circular manner. The difficulties of diagnosis have rendered late operations the rule, and the absolutely unfavorable prognosis has encouraged operation in many cases unfit for so serious a procedure. The results both immediate and remote have been correspondingly bad. An occasional case, apparently with a hopeless extent of disease, gets well after extirpation and stays well; this leads the surgeon to an effort in similar cases with very disappointing results.

An analysis of the more recent cases of Kocher and Maydl show a decreasing immediate mortality, and a more encouraging percentage of permanent cures depending on an earlier diagnosis, and a better selection of cases. Maydl lost only 16 per cent., and in 28 per cent. there was early recurrence; the remaining 50 per cent. were still alive at the time of his report. Mayo Robson says that the evidence shows that operation can be reasonably expected to cure one case in three or four. Two years ago, within a period of six months the writer successfully performed pylorectomy and partial gastrectomy in three cases; up to that time no case had been explored sufficiently early to permit of radical operation, and I regret to say that, although encouraged by these cases to greater efforts, in all the cases explored since that time nothing further than palliative operation has been indicated, on account of the advanced progress of the disease. The Kocher operation for pylorectomy and partial gastrectomy has been adopted by surgeons generally, and, while modified in some particulars by various surgeons, can be considered the best plan of procedure. It avoids the fatal suture angle of the Billroth method by completely closing the stomach end and forming an independent anastomosis between the duodenum and the remaining portion of the stomach. In a comparison of these two methods, Guinard shows a mortality in 148 cases by the Billroth method amounting to 38 per cent., and in sixty-four cases by the Kocher method only 16 per cent. of deaths.

In my cases I found the following plan satisfactory. First tie and divide the necessary amount of the gastrohepatic omentum; this mobilizes the pylorus and lesser curvature, and permits it to be easily delivered. The fingers are now passed behind the pylorus, from above, into the lesser cavity of the peritoneum; this renders ligation of the gastrocolic omentum free from the danger of injury to the vessels in the transverse mesocolon. The stomach should then be clamped above the disease, and with a knife a circular cut should be made completely around the healthy stomach to the mucous coat; the peritoneal and muscular coats are stripped back a half-inch, and the few bleeding vessels are caught with forceps and tied; the mucous coat is cut inch by inch from above downward, and sutured with a continuous catgut suture as cut, preventing leakage. After complete separation, the tumor is covered and turned to the right out of the way. The muscular coat is then sutured with a continuous catgut suture; finally, the peritoneum is turned in by a good silk Cushing stitch. The stomach is now sutured to the pedicles of the tied omenta anchoring it to the right, furnishing further protection against leakage, and also preventing undue traction on the duodenum, which, after safe amputation beyond the disease, is fastened to the anterior wall of the stomach by a Murphy button. The operation is with some slight modification the Kocher method. Kocher uses the posterior anastomosis with suture. Czerny has used both the anterior and posterior method with suture and with the button. He thinks it makes little difference in the result. Greig Smith well says that any extirpation requiring over one hour for its performance is open to serious objection.

Czerny speaks favorably of Tupolskes's method of doing the operation in two stages where the patient is much debilitated. First the gastro-enterostomy to be followed in three weeks by pylorectomy. The interval enables the patient to recuperate his strength; he has practised this in one case. Kummel has also advocated this in starvation cases. Czerny says that one objection can be made,—the adhesions following the gastro-enterostomy interfere with the extirpation. It is a question whether the average patient, after experiencing the relief afforded by successful gastro-enterostomy, would submit to a second operation, and especially to one which promises so little as to permanent cure. Kocher has made the extirpation by his present method thirty times with five deaths. Malthe, in the Christiana clinic, had only one death in eleven cases. Kocher, out of a total of fifty-seven extirpations, had eleven alive, and five of these of such length of time as to be called cured.

The immediate mortality of pylorectomy varies from 25 to 55 per cent. In properly selected cases it should have as low or a lower death-rate than gastro-enterostomy. Pylorectomy requires the patient to be in good condition, and the growth must be in the early stage; gastro-enterostomy for malignant disease has no such limitations.

Levy has described an operation for the resection of the cardiac end of the stomach, but I am unable to find that it has been performed upon the living subject. Chlumsky says that any death within thirty days should be classed as operative mortality, and I believe this conclusion a just one.

The *palliative operations* depend on the situation of the growth, and are based on mechanical conditions. Malignant obstruction of the cardiac orifice demands gastrostomy, and best at an early date, without waiting for marked starvation symptoms.

Relief from the irritation of the passing food markedly delays the progress of the disease, comparing in this respect with colostomy for the relief of cancer of the rectum. The original operations were undertaken with the one view of feeding the patient, the Fenger operation being the type. The author did his first gastrostomy after this plan, and the distress from the leakage almost equalled the benefit. In many cases the irritation from the leakage and enlargement of the fistula from ulceration constituted so distressing an after result that efforts were made to obviate this, and attempts to form a muscular sphincter about the opening were more or less successfully adopted.

The von Hacker operation using the left rectus muscle fibres for this purpose is the best of the kind. But not until Witzel published his method of lateral folding of the stomach wall about a rubber tube, forming an oblique channel and valvular opening, was the problem solved. The author has made four gastrostomies by this method, and the result in each instance was most gratifying. The Kader operation, which Curtis says was first described by Stam, is an adaptation of the Witzel method; the only difference being that the tube is introduced directly into the stomach cavity, and the walls brought up about it by a circular purse-string suture, Stam, or by lateral interrupted sutures, Kader. The object is to cause a cone or nipple-like projection to present into the gastric cavity. In the one case the writer used this method, the result was equally as good as in the Witzel plan. It is of special advantage in some cases on account of the ease with which a gastrostomy can be quickly done on a very small stomach.

The Marwedel operation is also a modification of the Witzel, the rubber tube being obliquely buried in the wall of the stomach itself. It is highly commended by Dennis, and undoubtedly is as perfect as the method of either Witzel or Kader. The Ssbanajew-Frank method of gastrostomy is on an entirely different principle, and has great advantage in not requiring a tube. The fistula formed is a mucocutaneous one, and therefore permanent, while by the peculiar displacing upward of the cone of the stomach brought out of the deeper layers of the abdominal wall, a spout-like opening is maintained which is self-closing and does not leak. The only disadvantage is the difficulty of making the operation on a contracted stomach. McCosh gives the mortality of gastrostomy for malignant disease at 30 per cent.

The palliative treatment of advanced cancer of the body of the stomach is unsatisfactory; fortunately, mechanical conditions arising from this form of disease are unfrequent. Occasionally on exploration an inoperable growth of this kind is found, and the question is, Can we prolong life or induce future comfort? If sufficient healthy stomach remains on the cardiac side to permit of gastro-enterostomy, this should be done. The curetting of such growths through a gastrotomy wound advocated by Bernays has little to commend it, nor can the actual cautery so useful in advanced cancer of the uterus be used to any great advantage. Should the growth involve the orifices of the stomach, starvation may necessitate duodenostomy or jejunostomy for feeding purposes. Edward Martin reports a case relieved by duodenostomy made in a similar manner to the gastrostomy of Witzel.

Jejunostomy has had some degree of prominence, and at one time was a rival of gastro-enterostomy. Maydl performed twenty-five jejunostomies with four deaths, and strongly urges the operation in selected cases. Heidenhain reports several very satisfactory results from the operation, and believes that in cases in which the gastro-intestinal fistula must be made at a point within the possible future progress of the disease that jejunostomy is indicated rather than gastro-enterostomy.

Obstructions at the pyloric opening are most common, and the gastric retention which results demands relief. Gastro-enterostomy is the most generally useful operation performed on the stomach; in suitable cases prolonging life, relieving pain, and promoting comfort.

It would be an unprofitable undertaking to go into the various methods of making the anastomosis, the literature of the subject is enormous. Two methods of performing gastro-enterostomy have stood the test of time,—the simple suture operation and the Murphy button. At the present stage of development the results are about the same, depending more on the experience of the operator than the method employed. In performing the operation by either method, it is important that the jejunum should be grasped at its origin and a coil formed about fourteen to sixteen inches in length. At this point the mesentery is also of sufficient length to prevent traction.

Care should be taken to have the direction of the peristalsis the same in the stomach and intestine when the anastomosis is effected. There has been considerable discussion as to whether the fistula should be established on the anterior (Wölfler) or posterior wall (Von Hacker) of the stomach. The latter necessitates an artificial opening into the lesser cavity of the peritoneum to get to the desired part of the posterior wall, and requires a larger incision with greater exposure. Its supposed advantages are, that gravity will aid in passing the food downward; and if the button has been used, that it is less liable to be retained in the stomach, and, lastly, that regurgitant vomiting of bile and pancreatic juices is less frequent; all of which are important points in favor of this locality for anastomosis, if true. It is open to question if it is true in any particular, and, so far as I have been able to judge from a somewhat careful examination of the literature, there is in reality no difference in the results, and, as the anterior operation is simpler, I prefer it. Carle and Fantino apparently demonstrated the superior advantages of the posterior operation. These investigators also showed by experimental work that bile was frequently, if not usually, present in the stomach for three months after gastro-enterostomy, and in moderate quantities did not interfere with digestion. On the contrary, at the Breslau clinic the anterior method gave the best results. If the posterior operation is chosen, the suggestion of Meyer, that the edges of the divided mesocolon be sutured to the posterior wall of the stomach, should be carried out to prevent contraction of the mesenteric opening. For the anterior operation, a point on the healthy portion of the stomach should be chosen as near the pylorus as will probably remain free from encroachment of the disease. It should be placed near the greater curvature.

In my cases I have tried to get the lower border of the anastomotic opening about one inch above the inferior border of the stomach. When completed the traction weight of the attached bowel draws the stomach over until at the point of attachment the anterior wall becomes the inferior, and a funnel-shaped entrance into the bowel is secured. This can be readily observed before closing, by lifting up the abdominal wall with a retractor, exposing the field of operation. I believe that this mechanical condition in the completed gastro-enterostomy prevents to a large extent the vicious circle of the biliary and pancreatic juices which has proved so prolific a source of danger to the patient.

The anterior operation has usually been made too high up on the stomach wall. The anastomosis should be at a low point, so that gravity will empty the stomach and prevent the entrance of bile. In eleven anterior gastro-enterostomies which I have made for malignant disease, in only two cases was regurgitant vomiting marked. One subsided after a single stomach lavage and the second required lavage once or twice a day for five days, both cases recovered. Of twenty gastro-enterostomies made for non-malignant disease in none was regurgitant vomiting present. It is a more common complication of malignant disease, and perhaps in part due to the changed nutrition affecting the glandular secretions as well as the reduction in the motor power so characteristic of cancer of the stomach.

Entero-anastomosis between the proximal and distal limbs of the jejunum as advocated by Jaboulay-Braun to prevent this complication has been considered of value by Weir. The latter uses a small Murphy button for the purpose, and with long forceps introduces each half of the button from inside the lumen of the intestine, making a small opening through the intestinal wall large enough to admit the cylinders and clamps without sutures. Mikulicz made entero-anastomosis four times after regurgitant vomiting had commenced, as a secondary operation, with success in checking regurgitation. Doyen has recommended that the bowel be divided and the distal end anastomosed to the stomach, the proximal end being joined to the small bowel, in this way avoiding, as he believes, the danger of the vicious circle and preventing dilatation of the proximal portion of the loop.

Rutkowski adds to the gastro-enterostomy a Witzel or Kader gastrostomy, and introduces a rubber tube, from the surface through the external fistula and the stomach, into the intestine by way of the anastomotic opening. Witzel speaks highly of this method both in preventing the establishment of a false route and also as providing a means of early feeding through the tube. It has been recommended that the tube be fastened into the gastro-enterostomy opening by an absorbable suture to prevent it from slipping upward into the stomach. The necessity for such complicated operations for the purpose of preventing regurgitant vomiting is open to serious question. Czerny had only one fatal case of intestinal regurgitation in sixty-five gastro-enterostomies, and this case was complicated by free hæmorrhage from an ulcerating carcinoma. Czerny believes the button prevents spur-formation while in place, and prefers the posterior operation. Mikulicz had seventy-four gastro-enterostomies in the Breslau clinic with twenty-four deaths, spur-formation accounting for six, or 25 per cent. of the mortality. In the fatal cases due to spur-formation the proximal loop was enormously distended and the intestinal tract empty, the patients dying of starvation. The latter operator abandoned the posterior operation on this account. At the time of the report he was using the anterior method with the Murphy button, and his results were very satisfactory. The suture operation of Wölfler brings the lateral wall of the jejunum to the side of the stomach, and Senn fixes the bowel at several points each side of the opening to prevent angulation, and favors a long visceral incision to prevent contraction. Kocher loops the bowel up in such manner as to produce a rather marked angle, the anastomosis being at the apex of the knuckle. Fenger has modified the anterior suture operation of Kocher in a most important particular, and theoretically it would appear to be a good method. The suturing is proceeded with as in the Kocher plan, but from the middle of each half of the anterior surface of the stomach and bowel; an incision from three-quarters of one inch to an inch in length is made, that is, from the centre of the unfinished upper half towards the lesser curvature of the stomach and downward along the convexity of the bowel to the same extent. On closing this wound the anterior portion of the anastomotic opening is greatly lengthened and spur-formation with its attendant evils may be prevented. It is not so injuriously affected by future contraction as the Kocher operation. Fenger's modification simply performs the office of "Pyloroplasty" upon the anterior surface of the opening.

In the hands of its originator the results in three cases have been highly satisfactory.[1] The writer has used the Murphy button in all of his operations and has been satisfied with the results. Death followed three out of eleven gastro-enterostomies for malignant disease and in only one out of twenty non-malignant cases. In no case was the button found to be at fault. Two died of aspiration pneumonia and two of exhaustion. A form of collapse after operation for malignant disease in the abdomen coming on about the fourth day, in my experience, has been a rather frequent fatal termination. The post-mortem does not show adequate cause for the exhaustion. In the Breslau clinic collapse was given as the cause of death in thirteen out of twenty-four fatal cases.

In using the button, the female half should be placed in the intestine first after a preliminary purse-string suture. The stomach wall should be cut to the mucous coat before placing the suture, and the latter should be close to the margins of the incision to render approximation easy, otherwise the thick wall of the stomach will ruffle up and expose the suture at some point. This is less true of malignant disease than non-malignant, as the shorter period of obstruction does not permit of adequate compensation, and the ability to develop muscular structure is deficient.

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[1] In a later communication Fenger reports a fourth case which died from regurgitant vomiting.

Kummel placed the stomach half of the button in position and *closes* the incision to the cylinder by sutures. In a later report Kummel says that he has since had an accident from this cause, and he has now returned to the purse-string suture of Murphy. Kammerer speaks of the button as being especially adapted for the posterior operation and the suture for the anterior. Supplementary sutures outside of the button are unnecessary, and may prove a source of danger. I have never used them. In using the button one should be careful to prevent a hæmatoma infiltrating the walls of the stomach outside the grasp of the button, as the sloughing process may cause an infection of the clot and perforation beyond the limiting adhesions. The main objection made to the button is that it often falls back into the stomach; this occurred in a number of my cases, and no harm has resulted. Weir and Kummel have each modified the intestinal half of the button, enlarging it in such a way as to prevent its passing into the stomach.

I do not know of the value of the modification. Malthe says that if the button in position lies to the right of the spinal column it will pass downward, if to the left it will drop back into the stomach. For some time I have paid no attention to the passing of the button. It saves the patient much anxiety, and is often passed after leaving the hospital without his knowledge. Meyer speaks of finding the button in the rectum in many of his cases. Colicky pains and symptoms of obstruction may appear while the button is in transit, this readily subsides by prohibiting food for a short time.

Contraction of the anastomotic opening after the button operation does not often occur. Meyer was able to find only one case. That some contraction should take place with the diminished size of a dilated stomach is to be expected, but in none of my cases has failure to empty the stomach properly occurred after the operation and for non-malignant disease. I have one case of over six years' duration and several beyond three years. Gastro-enterostomy for malignant disease has a mortality of about 38.3 (Robson). Czerny in 65 recent cases had a mortality of 38.5; Mukulicz, 74 cases, mortality 32 per cent.; Perman, of Stockholm, 42 cases and 15 deaths.

Section 6.—The special preparation of the stomach for operation is of importance. Under normal conditions bacteria do not flourish in the stomach, although present under ordinary food conditions. With carcinoma, motor insufficiency, retention, and in the later stages ulceration, present conditions favoring development of germs as well as the saprophytes of putrefaction. In Halsted's clinic, Cushing has been able to secure a high degree of sterilization of the stomach by means of careful antiseptic cleansing of the teeth and mouth and heat sterilization of the food. Lavage as a means of aiding the cleansing process is very necessary. The mechanical removal of the gastric contents washes out the unabsorbed food products and prevents decomposition.

Guillot does not favor lavage immediately prior to operation upon the stomach, believing that it tends to weaken the patient at a critical time. Purgation before the operation he also opposes on the same grounds. Among surgeons generally the opposite view is held, lavage and purgation being considered essential as preliminary preparation.

The writer does not ordinarly favor marked changes in the diet of surgical cases shortly before operation. The patient of average intelligence can materially aid the surgeon in selecting articles of diet which experience has taught him cause the least harm. If these articles can be sterilized by cooking and the remains be removed by stomach lavage before decomposition occurs, we will have accomplished something in the way of securing a proper wound site. Undoubtedly a greater amount of good would be accomplished by a diet beginning some days before operation, but the necessary experimentation to secure proper feeding takes valuable time, and the immediate result is often to temporarily disarrange the already enfeebled digestive power. Attempts to add to the patient's strength before operation by rectal feeding to supplement stomach absorption may be objectionable. In many cases the rectum becomes intolerant after a few days, and its value may in this way be seriously impaired for carrying on nutrition after operation.

My own experience has been that the patient does fully as well if either method alone is employed. Not more than a few days should be spent in preliminary preparation. The stomach should be carefully emptied of its contents just previous to the operation; this is seldom as successful as one could wish. Often the wash-water will return quite clear, and on opening the stomach a few moments later, a quantity of dirty fluid will be encountered. This renders accidental wound soiling possible, and in elevating the stomach out of the abdominal incision gravity may cause the fluids to pass into the œsophagus.

Aspiration pneumonia under such circumstances is very liable to occur after operation. I had two deaths from this cause. Fifteen out of a total of twenty deaths after stomach operation in the Heidelberg clinic were from pneumonia. Czerny does not think it is due to the anæsthetic, as it occurred twice in five cocaine operations, and, as it often came on in the first forty-eight hours, it could not be due to confinement to bed. In his experience it was most common in males with a previous bronchitis or emphysema, and due, he believes, to the incision interfering with abdominal respiration. In debilitated cases very little anæsthetic is needed,—a preliminary hypodermic of morphine with just enough ether or chloroform to enable painless division of the abdominal coverings and again to close. No pain is felt during the gastro-intestinal manipulations. Local anæsthesia by cocaine in very debilitated subjects is an ideal method, provided the operation is short and does not require traction on the margin of the abdominal incision.

Abbe and others have used it to a considerable extent in stomach surgery. The experience of Bloodgood and Cushing in hernia work and Matas in cocainization of nerve trunks suggests a wider field for its employment. The after care is mainly to counteract shock, which the nearness to the great sympathetic ganglia and direct injury to the terminal filaments of the vagi often renders severe. Morphia, strychnine, and atropia are useful to meet indications, and, if necessary, saline infusions. Rectal enemata of hot saline solutions or coffee are valuable adjuvants to prevent collapse. After the immediate danger has been overcome every effort to prevent exhaustion and death at a later stage must be made. The majority of surgeons prefer rectal feeding for the first few days. Successful rectal feeding requires experience and good judgment; the tendency is to over-feed and to use larger quantities than are well borne. The need of liquids is most apparent, and large enemata of saline solution at least once in twenty-four hours meet this indication. In my earlier cases, I am convinced that I withheld stomach feeding longer than was necessary. The general tendency is to earlier feeding by the mouth and less reliance is placed on rectal alimentation. Rectal feeding carries the patient along, but is inadequate and the patient does not gain.

Guillot begins liquid nourishment by the mouth two hours after partial stomach extirpation, and Roux gives whatever the patient desires and as soon as called for. This practice shows great confidence in the methods of suture in preventing leakage; but after an abdominal operation of this magnitude digestion for the first twenty-four hours is nearly at a stand-still, and food under such circumstances is liable to do harm. Chlumsky, in his experiments as to the strength of union after intestinal anastomosis, demonstrated that from the third to the fifth day the union was weakest. There was little difference between the button and the suture in this respect. These conclusions are borne out by clinical experience, and care should be exercised in feeding until union is complete. Elderly people bear confinement to bed badly, and do much better if allowed up within the first week.